



Appendix C

Glossary

Abiotic: Nonliving chemical and physical properties of the environment (e.g., soil moisture, nutrient availability, solar radiation).

Access: One has access to food when one has the necessary resources to obtain appropriate foods for a nutritious diet. Achieving food security requires few or no limitations on food access.

Adaptation: The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate harm or exploit beneficial opportunities. In natural systems, human intervention may facilitate adjustment to expected climate and its effects.

Adaptive capacity: The ability of systems, institutions, humans, and other organisms to adjust to potential damage, take advantage of opportunities, or respond to consequences.

Aerosol (atmospheric): A collection of airborne solid or liquid particles, with a typical size of between 0.01 and 10 μm , that reside in the atmosphere for at least several hours. Aerosols may be of either natural or anthropogenic origin.

Aflatoxin: Toxic metabolite produced by fungal species in the genus *Aspergillus*. Toxin production is dependent on environmental factors during preharvest, storage, and processing.

Agricultural inputs: Resources used to sustain or increase agricultural production, including but not limited to crop chemicals, crop seed and biotech traits, fertilizers, farm machinery, animal health/nutrition products, and animal genetics products.

Availability: The existence of food in a particular time and place. Food availability addresses the “supply side” of food security and is determined by levels of food production, stocks, and net trade. The availability of food does not guarantee that it is accessible or that it may be utilized.

Biodiversity: The variability among living organisms from terrestrial, marine, and other ecosystems. Biodiversity includes variability at the genetic, species, and ecosystems levels.

Bioenergy: Energy derived from any form of biomass, such as recently living organisms or their metabolic by-products.

Biofuel: A fuel, generally in liquid form, developed from organic matter or combustible oils produced by living or recently living plants. Examples of biofuel include alcohol (bioethanol), black liquor from the paper manufacturing process, and soybean oil.

Biophysical: Describes biotic and abiotic factors in biological systems.

Biotic: The living properties of the environment (e.g., populations of prey, predators, and pests).

Carbohydrate: Any member of a group of organic compounds made up of carbon, hydrogen, and oxygen. Carbohydrates produced by plants are an important component of the animal diet.

Carbon sequestration: The uptake (i.e., the addition of a substance of concern to a reservoir) of carbon-containing substances, in particular carbon dioxide (CO_2), in terrestrial or marine reservoirs. Biological sequestration includes direct removal of CO_2 from the atmosphere through land-use change, afforestation, reforestation, revegetation, carbon storage in landfills, and practices that enhance soil carbon in agriculture (e.g., cropland management, grazing land management).

Cereal: Any species in the grass (*Poaceae*) family yielding edible grain.

Climate: In a narrow sense, the average weather of the entire Earth, or a particular region or location, over a time period of months to decades, or longer. Climate is usually described statistically in terms of the mean and variability of atmospheric properties such as temperature and precipitation. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. Climate in a wider sense is the state (including a statistical description) of the climate system.

Climate change: A long-term change, or trend, in the state of the climate generally driven by an external factor, persisting for decades to centuries, or longer. Climate change is usually described statistically by changes in the mean and/or the variability of atmospheric properties such as temperature and precipitation.

- **Natural climate change** is caused by internal climate system processes, such as cyclical changes in atmospheric and ocean circulation, or natural forces external to the climate system, such as volcanic eruptions or a decrease or increase in solar energy entering the atmosphere.
- **Anthropogenic climate change** is caused by human activities, such as land-use change or industrial processes that result in GHG emissions that change the composition of the atmosphere, and is in addition to natural climate variability observed over comparable time periods.
- **Climate change impact assessment**—the practice of identifying and evaluating, in monetary and/or nonmonetary terms, the effects of climate change on natural and human systems.

Climate model: A numerical representation of the climate system based on the physical, chemical, and biological properties of its components and their interactions and feedback processes, and accounting for some of its known properties.

Climate prediction: A climate prediction or climate forecast is the result of an attempt to produce (starting from a particular state of the climate system) an estimate of the actual evolution of the climate in the future, for example, at seasonal, interannual, or decadal time scales.

Because the future evolution of the climate system may be highly sensitive to initial conditions, such predictions are usually probabilistic in nature.

Climate projection: The simulated response of the climate system to a scenario of future emissions or concentrations of GHG and aerosols generally derived using climate models.

Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized.

Climate scenario: A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit

use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as the observed current climate. A climate change scenario is the difference between a climate scenario and the current climate.

Climate system: The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere, and the biosphere, and the interactions among them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, and anthropogenic forcings such as the changing composition of the atmosphere and land-use change.

Climate variability: Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability) or to variations in natural or anthropogenic external forcings (external variability).

Crop yield: The measurement of the amount of cereal, grain, or legume produced per unit area, normally measured in metric tons per hectare. Yield multiplied by area harvested equals total agricultural production for a crop in a region.

Demography: The statistical study of human population size, trends, density, distribution, and other vital data.

Distributing: Transporting unprocessed and processed food to a market, between markets, and from a market to communities for retail.

Domestic supply: The amount available for food consumption once other uses (e.g., animal feed, biofuels) and food exported and either put in or taken out of stock are calculated at the national level. When divided by the total population, it estimates the per-capita food available for consumption.

Downscaling: A method that derives local- to regional-scale (generally one to a few tens of kilometers) information from larger scale models or data analyses. There are two main methods: dynamical downscaling and empirical/statistical downscaling. The dynamical method uses the



output of regional climate models, global models with variable spatial resolution, or high-resolution global models. The empirical/statistical method employs observed statistical relationships that link the large-scale atmospheric variables with local/regional climate variables. In all cases, the quality of the driving model remains an important limitation on the quality of the downscaled information.

Drought: A period of abnormally dry weather long enough to cause a serious hydrological imbalance. Drought is a relative term; therefore, any discussion in terms of precipitation deficit must refer to the particular precipitation-related activity that is under discussion. For example, shortage of precipitation during the growing season impinges on crop production or ecosystem function in general (due to soil moisture drought, also termed agricultural drought) and during the runoff and percolation season primarily affects water supplies (hydrological drought). Soil moisture and groundwater are also affected by increases in actual evapotranspiration in addition to reductions in precipitation. A period with an abnormal precipitation deficit is defined as a meteorological drought. A megadrought is a very lengthy and pervasive drought, lasting much longer than normal, usually a decade or more.

Dry spell: A period of time without precipitation. Typically this is a number of consecutive dry days without agriculturally meaningful rainfall (generally <1 mm/day) during a growing season, resulting in a measurable decline in crop yield.

Ecosystem: A biological community of interacting organisms and their physical environment.

Ecosystem services: The benefits people obtain from functioning natural ecosystems, such as provisioning of high quality soil, regulation of waste, and production of oxygen.

Edema (nutritional): A form of acute malnutrition that results in bilateral fluid retention, typically starting in the feet. It is measured by applying thumb pressure to the top of both feet for 3 seconds and checking whether this leaves a pit. If pits are not seen on both feet it is not nutritional edema.

Emissions scenarios: A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g., GHG, aerosols), based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change) and their key relationships.

Environmental enteropathy: A subclinical condition caused by contamination of the food and/or water supply, resulting in blunting of intestinal villi and intestinal inflammation, and diminishing a body's ability to assimilate nutrients from food.

Extensification: Using more land to grow more food, typically using traditional management strategies, as opposed to sustainable intensification on land already in use through improved farm management.

Extreme event: An event that causes large fluctuations in the behavior of an element of the food system, such as a large reduction in agricultural yield or abrupt changes in the price of oil. By definition, the characteristics of what is called an extreme event may vary from place to place.

Famine: An extreme food shortage during which at least 20% of households in an area have a limited ability to cope, the acute malnutrition rate exceeds 30%, and the crude death rate exceeds either 2 per 10,000 per day or the under-5 mortality rate exceeds 4 per 10,000 per day.

Food energy: Energy (calories) that animals and people derive from their food by consuming and digesting it; needed to maintain energy for living.

Food safety: Assurance that a food or beverage product does not pose a health risk when consumed orally either by a human or an animal.

Food security: A state or condition when all people at all times have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

Food sovereignty: The right of countries and peoples to define agricultural, pastoral, fishery, and food policies that are ecologically, socially, economically, and culturally appropriate for them.

Food supply chain: A network of food-related business enterprises through which food products move from production through consumption, including preproduction and postconsumption activities.

Food system: Encompasses activities whose ultimate goal is individual food consumption: that is, producing, processing, packaging, distributing, transporting, refrigerating, retailing, preparing, and consuming food.

Food value chains: Food value chains are distinguished from traditional food supply chains by the combination of how they operate as strategic partnerships (business relationships) and how they



differentiate their products (by focusing on food quality and functionality, and environmental and social attributes).

Forcing (radiative): Radiative forcing is the change in the net, downward minus upward, radiative flux (expressed in W m^{-2}) at the tropopause or top of atmosphere due to a change in an external driver of climate change, such as, for example, a change in the concentration of carbon dioxide or the output of the Sun.

Genetically modified organisms: Organisms (i.e., plants, animals, or microorganisms) in which the genetic material (DNA) has been altered in a way that does not occur naturally by mating and/or natural recombination.

Global climate models: Formally known as “general circulation models” in the climate science literature. A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions and feedback processes, and accounting for all or some of its known properties.

Green revolution: A series of research, development, and technology transfer initiatives, occurring between the 1940s and the late 1960s, that greatly increased agricultural productivity.

Greenhouse gases (GHG): Those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of terrestrial radiation emitted by the Earth’s surface, the atmosphere itself, and by clouds.

Gross domestic product: The sum of gross value added, at purchasers’ prices, by all resident and nonresident producers in the economy, plus any taxes and minus any subsidies not included in the value of the products in a country or a geographic region for a given period, normally 1 year. GDP is calculated without deducting for depreciation of fabricated assets or depletion and degradation of natural resources.

Heat stress: Physiological stress caused by elevated temperatures that results in the failure of the body’s means of controlling its internal temperature; in livestock, heat stress can make animals more susceptible to illness.

Heavy precipitation events: Rainfall that exceeds the highest 10th percentile of 24-hour rainfall events based on the historical distribution of precipitation events at a given location.

Horticultural: Having to do with the practice of growing fruits, vegetables, and ornamentals.

Hunger: Not having enough to eat to meet energy requirements. Hunger can lead to malnutrition, but absence of hunger does not imply absence of malnutrition.

Impact assessment: The practice of identifying and evaluating, in monetary and/or nonmonetary terms, the effects of climate change on natural and human systems.

Integrated assessment model: A quantitative model used to combine, interpret, and communicate knowledge from diverse scientific disciplines so that all relevant aspects of a complex societal issue can be evaluated and considered for the benefit of decision making.

Intensification: Intensification in conventional agriculture is understood primarily as using a higher input of nutrient elements and of pesticides per land unit. It also means more energy (direct for machinery and indirect for inputs).

Just-in-time: An inventory strategy companies employ to increase efficiency and decrease waste by receiving goods only as they are needed in the production process, thereby reducing inventory costs.

Land use: The social and economic purposes for which land is managed (e.g., grazing, timber extraction, and conservation).

Macronutrients: Nutrients required in relatively large quantities; includes proteins, simple and complex carbohydrates, and fats and fatty acids.

Malnutrition: A broad term that encompasses both undernutrition and overnutrition. People are malnourished if their diet does not provide adequate calories, protein, and other nutrients for growth and maintenance or they are unable to fully utilize the food they eat due to illness (undernutrition). They are also malnourished if they consume too many calories and/or other nutrients (overnutrition).

Micronutrients: Nutrients essential to body processes and required in relatively small quantities; includes vitamins and minerals.

Mitigation: A human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Mycotoxins: Poisonous chemical compounds produced by certain fungi. They can have great significance in the health of humans and livestock. The effects of some food-borne mycotoxins are acute, symptoms of severe illness appearing very quickly. Other mycotoxins occurring in food have longer term chronic or cumulative effects



on health, including the induction of cancers and immune deficiency.

Overnutrition: When nutrients are consumed beyond the amounts required for normal body functioning, leading to deleterious health effects.

Packaging: The process of packaging food involves providing containment, security, tampering resistance, and physical, chemical, or biological protection. It may bear a nutrition facts label and other information about food being offered for sale.

Pathogen: Infectious agent that causes disease in virtually any susceptible host.

Photosynthesis: The process by which plants take carbon dioxide from the air (or bicarbonate in water) to build carbohydrates, releasing oxygen in the process. There are several photosynthetic pathways, each with different responses to atmospheric carbon dioxide concentrations.

Post-farm gate: Post-farm gate activities are all food system activities that occur after a raw material has left the farm, fishery, or forest and typically include processing, packaging, trading, retailing, and consuming.

Processing: Processing is the transformation of raw ingredients into food or of food into other forms. Food processing typically takes harvested crops or animal products and adds value to these to produce attractive, marketable, and often long shelf-life food products that can be purchased in a store.

Producing: Producing food describes on-farm activities to raise crops and livestock, as well as off-farm natural resource extraction, such as hunting and fishing, that results in the raw materials of food products.

Projection: A projection is a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Unlike predictions, projections are conditional on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized.

Purchasing power parity: Purchasing power parity conversion factor is the number of units of a country's currency required to buy the same amounts of goods and services in the domestic market as a U.S. dollar would buy in the United States.

Representative agricultural pathway: A consistent narrative together with quantitative information about the economic, technological, social, and institutional context in which agricultural development occurs that can be used for

agricultural model intercomparison, improvement, and impact assessment in a manner consistent with the new global pathways and scenarios.

Representative concentration pathway: A scenario that includes time series of emissions and concentrations of the full suite of greenhouse gases, aerosols, and chemically active gases, as well as land use/land cover. The word “representative” signifies that each RCP provides only one of many possible scenarios that would lead to the specific radiative forcing characteristics. The term “pathway” emphasizes that not only the long-term concentration levels are of interest, but also the trajectory taken over time to reach that outcome.

Resilience: The capacity of a social-ecological system to cope with a hazardous event or disturbance, responding or reorganizing in ways that maintain its essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation.

Risk: The potential for consequences where something of human value (including humans themselves) is at stake and where the outcome is uncertain. Risk is often represented as probability of occurrence of hazardous events or trends multiplied by the consequences if these events occur. This report assesses climate-related risks.

Risk assessment: The qualitative and/or quantitative scientific estimation of risks.

Risk management: The plans, actions, or policies implemented to reduce the likelihood and/or consequences of a given risk.

Scenario: A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change, prices) and relationships. Scenarios are neither predictions nor forecasts but are useful to provide a view of the implications of developments and actions.

Senescence: The process by which plants age, leading to organ or plant death while metabolites are recycled.

Shared socioeconomic pathways (SSPs): SSPs describe plausible alternative trends in the evolution of society and natural systems over the 21st century at the level of the world and large world regions. They consist of two elements: a narrative storyline and a set of quantified measures of development. SSPs are “reference” pathways in that they assume no climate change or climate impacts, and no new climate policies.



Shock: A sudden upsetting or surprising incident that causes a system or process to react abruptly.

Smallholders: Smallholders are small-scale farmers, pastoralists, forest keepers, and fishers who manage areas varying from less than 1 ha to 10 ha in size. Smallholders are characterized by family-focused motives, such as maintaining the stability of the farm household system, using mainly family labor for production and using part of the produce for family consumption.

Socioeconomic: Relating to or concerned with social and/or economic factors.

Special Report on Emissions Scenarios (SRES):

The storylines and associated population, GDP, and emissions scenarios associated with the Special Report on Emissions Scenarios (SRES), and the resulting climate change and sea level rise scenarios. Four families of socioeconomic scenario (A1, A2, B1, and B2) represent different world futures in two distinct dimensions: a focus on economic versus environmental concerns, and global versus regional development patterns.

Stability: The consistency of the three other components of food security (availability, access, and utilization) over time and space. The stability of food availability, access, or utilization might vary due to seasonal or annual weather cycles, or due to sudden shocks (e.g., an economic or climatic disruption).

Stakeholder: An entity, such as a person, business, or organization, with an interest or concern in something.

Stressor: Something that has an effect on people and on natural, managed, and socioeconomic systems. Multiple stressors can have compounded effects, such as when economic or market stress combines with drought to negatively impact farmers.

Stunting: Chronic malnutrition that reflects chronic exposure to food insecurity. Stunting is measured by calculating a child's height for age and comparing that to the median of a reference population. If the child's height-for-age falls below two standard deviations of the median, the child is considered stunted.

Threshold: The level of magnitude of a system process at which sudden or rapid change occurs. A point or level at which new properties emerge in an ecological, economic, or other system, invalidating predictions based on mathematical relationships that apply at lower levels.

Total Factor Productivity (TFP): The portion of output not explained by the amount of measured inputs used in production.

Uncertainty: An expression of the degree to which future climate is unknown. Uncertainty about the future climate arises from the complexity of the climate system and the ability of models to represent it, as well as the inability to predict the decisions that society will make. There is also uncertainty about how climate change, in combination with other stressors, will affect people and natural systems.

Undernourishment: A measure for hunger compiled by FAO, it refers to the proportion of the population whose dietary energy consumption is less than a predetermined threshold. This threshold is country specific and is measured in terms of the number of kilocalories required to conduct sedentary or light activities but not active physical labor, such as farming. The undernourished are also referred to as suffering from food deprivation.

Undernutrition: The outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted), and deficient in vitamins and minerals (micronutrient malnutrition).

Utilization: Nutritional value of food and how the body assimilates a food's nutrients. Sufficient energy and nutrient intake is also the result of biophysical and sociocultural factors related to food safety and food preparation, dietary diversity, religious practices, and distribution of food.

Value chain: The full range of value-adding activities required to bring a product or service through the different phases of production, including the procurement of raw materials and other inputs.

Vector: In epidemiological terms, a person, animal, or microorganism that carries and transmits an infectious pathogen to another organism.

Vulnerability: The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts, including sensitivity or susceptibility to harm and lack of capacity to cope and adapt.

Wasting: Acute malnutrition, or "wasting," results from a rapid decrease in food consumption over a short period of time and from illness. It is measured by calculating a child's weight for age and comparing that to the median of a reference



population. If the child's weight-for-height falls below two standard deviations of the median, the child is considered wasted. Wasting can also be measured through checking a child's or adult's mid-upper arm circumference.

Weather: The state of the atmosphere, mainly with respect to its effects upon life and human activities. As distinguished from climate, weather consists of the short-term (minutes to months) variations of the atmosphere. Popularly, weather is thought of in terms of temperature, humidity, precipitation, cloudiness, brightness, visibility, and wind.

Yield gap: The difference between the realized crop productivity of a place and what is attainable using the best genetic material, technology, and management practices.

